UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 1
5 POST OFFICE SQUARE, SUITE 100
BOSTON, MA 02109-3912

April 24, 2019

Mr. Ron Ruth
Sherin & Lodgen LLP
101 Federal Street
Boston, MA 02110

Re: Corrective Action Requirements and Achievement of Interim Goals Stop & Shop Supermarket (224 Elliott Street, Beverly, MA), McDonald's (230 Elliott Street, Beverly, MA) and adjacent open-space parcel along the Bass River; Former United Shoe Machinery Division, EPA ID No. MAD043415991

Dear Mr. Ruth:

The U.S. EPA Region 1-New England has completed review of the April 2018 Intertidal Sediment data Summary Report and Screening Level Ecological Risk Assessment (SLERA) for the Bass River Intertidal Area Adjacent to the Retail Development South Parcel of the Former United Shoe Machinery Facility (USM) in Beverly, MA. Attached are the final comments on the SLERA Report. No additional response or revisions are necessary. The comments are being provided to you for your information and future reference.

Thank you for your cooperation in completing the SLERA. If you have any questions, please contact me at 617-918-1368 (casey.carolyn@epa.gov) or Sebastian Rodriguez at 617-918-1288 (rodriguez.sabastian@epa.gov) after May 31, 2019. Please note that I will be retiring the end of May and Mr. Rodriguez will be taking over the role as RCRA Facility Manager for the former USM facility.

Sincerely,

Carolyn J. Casey

Carolyn J. Casey
RCRA Corrective Action Facility Manager

Attachments

cc: D. Wainberg, U.S. EPA
S. Rodriguez, U.S. EPA
R. Knox, MassDEP

Technical Review of the April 2018 Intertidal Sediment Data Summary Report and Screening-Level Ecological Risk Assessment for The Bass River Intertidal Area Adjacent to The Retail Development South Parcel of the Former United Shoe Machinery (USM) Facility in Beverly, MA

Some aspects of this Screening Level Ecological Risk Assessment (SLERA) were not conducted in accordance with EPA guidance and are identified and discussed in detail in the comments.

- The "reference" locations selected and sampled are well within contact of the site area under evaluation. They are not isolated from site or its contaminants and so are of no use to the ecological risk evaluation and more specifically, in differentiating between site and non-site related risk contributions. Notably, the use of reference areas is not a requirement. However, without reference information, any risk found "on site" is considered to be site related.

- At this stage in an ecological risk assessment (ERA), the more acceptable no effect or threshold criteria should have been used to develop the initial cut of contaminants of potential ecological concern (COPECs). Instead the effects-based threshold values were used. The former criteria are to be used to ensure that any potential COPECs are not erroneously screened out. Using the preferred criteria, two additionally COPECs were identified (i.e., cadmium and arsenic).

- The reporting limit (RL) for copper, lead, nickel and zinc exceeded the chronic ambient surface water criteria (the effects threshold used to screen them) and therefore rendered that analysis unusable. Because the RL exceeded the criteria, rather than removing them as COPECs based on a determination of non-detect (ND), they should have been retained for further consideration.

Despite these and other limitations, the main finding that the targeted material of concern (i.e., slag), believed to be associated with the former United Shoe Manufacturing (USM) facility activities and disposal, is not likely to be a source of unacceptable risk. If the issues identified were corrected and the SLERA revised, it would not likely have any substantive impact on the risk determination.

An indirect observation from this review is that in many instances the sediment constituents in the Reference and Site Area are lower than the slag constituents but there are much higher chromium concentration in sediment from the Reference Area (located upgradient of the site and more adjacent to Shoe Pond outfall). It brings into question, at least, where is the chromium coming from and is it possible or probable that contaminants are discharging from Shoe Pond into the Bass River embayment making the North Parcel a source candidate?

<u>Site History and Environmental Setting</u>
The South Parcel of the former USM facility is located at 131 Elliott Street (Route 62) in Beverly, MA. Visible "slag" material is present along the shoreline of this piece of land. Historical information shows that much of this area was filled during the early 20th century to construct the USM South Parcel. The slag used for filling may have originated at the USM North Parcel. The current work investigated if this fill may be serving as a source of metals to the nearby Bass River.

The Bass River is a tidally-influenced creek which receives saltwater from the Atlantic Ocean and freshwater via the outlet of Lower Shoe Pond. The "head of tide" (i.e., the point at which the incoming tide cannot move further upstream) occurs in the immediate vicinity of where the sediment and surface water samples were collected for this project (see Figure 3 in the SLERA).

OBSERVATIONS

The Bass River is a tidally-influenced creek which receives saltwater from the nearby Atlantic Ocean and freshwater via the outlet of Lower Shoe Pond. Both the Site Area and the Reference Area are located on either side of the outlet at the "head of tide" at the northern-most point in the intertidal Bass River. The tide cannot move further upstream into Lower Shoe Pond.

The SLERA used the following lines of evidence to show that the concentrations of metals measured in the sediment samples collected at the Site Area were unlikely to have originated from the slag present in the Retail Development South Parcel, or to represent an unacceptable risk to benthic invertebrates or wildlife receptors. Statistical analysis showed that the concentrations of all the metals measured in the sediment samples collected at the Site Area and the Reference Area did not differ significantly ($\alpha = 0.05$) from each other. This result showed that the concentrations measured at the Site Area were statistically indistinguishable from the nearby reference conditions. However, a more relevant interpretation for this pattern is that the Site and the Reference Areas in the Bass River are only within a few hundred feet of each other and are not spatially disconnected from each other. This necessary separation is a core requirement to generate defensible reference concentrations and to be able to utilize the information to identify site related risk. In other words, to be used effectively, site-related contaminants cannot interact with the Reference Area. The reason for this likely linkage is that on every incoming tide it can be expected to "pool up" in the small bay just upgradient from the "site" and in front of the unpassable outlet of Lower Shoe Pond near both the Site and Reference Areas. This tidally influenced process is expected to create slow-moving currents and eddies which, over the past decades, may have likely picked up site sediments and moved suspended sediment particles between the intertidal zones of these two adjacent areas, thereby "smearing out" the concentrations between the two areas.

The SLERA does indirectly address the concern identified above of differentiating site sources by qualitatively comparing the metals concentrations measured in slag used as fill placed in the upland portion of the Site Area to those measured in the sediment samples collected at the site and the Reference Areas. This information showed that the mean concentration of metals measured in the slag was either roughly equivalent to or lower than those measured in the sediment samples collected from the site and "reference" sampling areas in the Bass River. In addition, cadmium, selenium, and silver were detected in sediment collected from either the Site Area or the Reference Area, but not in the slag itself. The SLERA reasonably observed that if the slag had been the source of metals to the sediment in the Bass River, then one would expect the metals concentrations in slag to exceed those measured at the Site and the Reference Areas.

All the sediment samples collected in the intertidal zone from the Site Area and the Reference Area were analyzed for AVS, SEM, and OC. The goal being to determine the possibility of the divalent metals cadmium, copper, lead, nickel, silver, and zinc being bioavailable to benthic invertebrates residing in the sediment. The modelling results involving the concentrations of AVS, SEM, and OC in all the Site Area and Reference Area sediment samples fell below the threshold value of 130 μmol/gOC, indicating that the six divalent metals were unlikely to be available and thereby not toxic to benthic invertebrates, regardless of their actual concentrations in the bulk sediment samples.

It is also noteworthy, that chromium, which is not a divalent metal (i.e., the bioavailability of this analyte to benthic invertebrates is not controlled by AVS and SEM), even though it was present at high levels in sediment collected from both the Site Area (mean concentration = 735 mg/kg) and from the Reference Area (mean concentration = 834 mg/kg), it was much lower in the slag (mean concentration = 40 mg/kg). This pattern strongly suggests an outside source not associated with the slag.

The location of the reference samples and the similarity of contaminant levels between the Site and Reference Areas, would make any food chain modeling unnecessary because the potential for ecological risk from ingesting sediment or food items (e.g., clams, marine worms, etc.) by semi-aquatic birds or mammals would be equivalent for both Areas.

The SLERA used an Analysis of Variance (ANOVA) to statistically compare the metals concentrations measured in the Site Area sediment samples against those measured in the Reference Area samples. The preferred approach in EPA Region 1 is to calculate the 95% Upper Confidence Limits (UCLs) of each site COPEC for comparison against the reference 95% UCL (i.e., no need to run ANOVAs). Further comment on this issue was not prepared because, while it was not the comparison preferred by the Agency, the statistical approach that was used in the SLERA was felt to be defensible.

GENERAL COMMENTS

General Comment 1:

The process of selecting sediment Contaminants of Potential Ecological Concern (COPECs) did not follow EPA guidance (EPA, 1997). The guidance states (see §1.3.1 on p. 1-9 of the guidance) that "screening ecotoxicity values should represent a No-Observed Adverse Effect Level (NOAEL) for long-term (chronic) exposures to a contaminant." This approach actually is re-iterated in the 1st sentence of the 1st ¶ of §5.3 (Effects assessment) on p. 16 of the SLERA which states, "Consistent with the SLERA guidance, the initial screening of each media of concern compares the maximum value in each media of concern to the most conservative toxicological benchmark (usually a "no-observed adverse effect level)." Yet, the SLERA used the Effect Range – Median (ER-M) sediment benchmarks published by Long et al., (1995). These values represent contaminant levels in sediment above which effects are generally or always observed. Hence, they should not be used to select COPECs because they are not conservative enough for that purpose.

Attachment 1 at the end of this technical memorandum presents the ER-Ms and Effect Range-Lows (ER-Ls, which are the correct "no-effect" benchmarks), alternative sediment benchmarks for two metals lacking ER-Ls and ER-Ms, the range of detected metal concentrations in the sediment samples collected from the site in the Bass River, the original COPECs, and the alternative COPECs derived based on the ER-Ls. Because of this more conservative approach, both arsenic and cadmium are identified as new COPECs. Both are retained as COPECs under the evaluation performed for this review because their maximum concentrations exceeded their alternative benchmarks.

Also, as shown in the Attachment, the SLERA had originally retained barium and selenium as COPECs but only because Long et al. (1995) did not have sediment screening benchmark for these two metals. For this review the two were compared against alternate benchmarks and continued to be retained as COPECs.

The potential for risk to benthic invertebrates associated with sediment exposure to the non-divalent metals arsenic, barium, chromium, mercury, and selenium was explored as part of this review (refer to Table 1 below).

If it was to be decided to revise the SLERA, the COPEC-selection process would need to be revised based on the information presented in these comments. However, it is being acknowledged that the more rigorous COPEC-selection process will not materially change the current general conclusions of the

SLERA.

General Comment 2:
The Bass River is a tidally-influenced creek which receives saltwater from the nearby Atlantic Ocean and freshwater via the outlet of Lower Shoe Pond. Both the Site Area and the Reference Area are located on either side of the outlet at the "head of tide" at the northern-most point in the intertidal Bass River. The tide cannot move further upstream into Lower Shoe Pond.

The SLERA assumed that any metals which may have leached from the slag at the Site Area would not migrate to the nearby Reference Area located in the embayment a couple of hundred feet from the Site Area. EPA mistakenly thought that the proposed reference location transects were across the bay and unlikely to be impacted by the site slag. This is partially due to the incomplete figures provided to EPA for review. The entire embayment should have been shown of the figures provided. EPA previously commented in writing and again of a conference call that reference location transects should be across the bay.

Statistical testing showed that the concentrations of all the metals measured in the sediment samples collected at the Site Area and the Reference Area did not differ significantly from each other. One plausible interpretation for this pattern is that the Site and the Reference Areas in the Bass River may not be as separated as was assumed. Spatial disconnection between a site and a reference area is a core requirement to generate defensible reference concentrations. In other words, site-related contaminant levels cannot affect the reference location. We believe, that when considering all the information, that this separation may not be present. The reason for the Site and Reference Area potential linkage is that every incoming tide can be expected to "pool up" in the small bay in front of the unpassable outlet of Lower Shoe Pond near both the Site and Reference Areas. This process is expected to create slow-moving currents and eddies which, over the past decades, is likely to have picked up and moved metals-enriched suspended sediment particles between the intertidal zones of these two adjacent areas, thereby "smearing out" the metal concentrations and generating the observed pattern of similarity described in the report.

SPECIFIC COMMENTS
Specific Comment 1: §2.2.5 Surface water sample analyses and results, 2nd ¶, final sentence, p. 6. The target sentence states "There is no National Recommended Water Quality Criterion for barium in seawater, therefore, the concentrations detected in surface water reflect natural levels of barium in seawater." The logic of this sentence is erroneous. Lack of a benchmark being unavailable has nothing to do with the measured concentrations reflecting natural levels.

Specific Comment 2: §4.4 Identifying constituents of potential ecological concern, 1st ¶. P. 12
The target sentence states "For surface water, arsenic, cadmium, chromium, copper, lead, nickel, selenium, silver and zinc were all below their respective analytical limits of detection so these elements were not identified as COPECs." This information does not reflect the data provided in Table II (Summary of surface water quality data) in the SLERA.

For example, the chronic National Recommended Water Quality Criteria (NRWQC) for arsenic is shown as 0.036 mg/L, whereas the Detection Limit (DL) for this analyte in all the surface water samples equals 0.005 mg/L. Hence, the benchmark concentration exceeded the DL for this analyte.

Alternatively, the chronic NRWQC for lead is shown as 0.0081 mg/L, whereas the DL for this analyte in all the surface water samples equals 0.01 mg/L. Hence, the benchmark concentration fell below the DL for this analyte.

Specific Comment 3: §5.1.2 Geochemical evaluation – relationships between metals, 2nd ¶, p. 14. The information presented in the target ¶ makes a strong but only circumstantial case, that the slag is unlikely to be the source of the metals found in the sediment samples collected from the Site Area in the Bass River. Table VI in the SLERA summarizes the results of an Analysis of Variance (ANOVA) which shows that the mean concentrations of all the metals measured in the Site Area sediment samples do not differ significantly from those measured in the Reference Area sediment samples.

Attachment 2 at the end of this technical memorandum presents the minimum, maximum, and mean metal concentrations for the 12 metals measured in the slag and the two sets of sediment samples collected from the Bass River. To better support the conclusions presented in §5.1.2, the slag metal data should have been included in the ANOVA to show more conclusively that the concentrations of metals measured in the slag are no worse, and often lower than, those measured in the sediment samples collected from either the Site and the Reference Areas.

Specific Comment 4: Table II, Summary of Surface Water Quality Data
This table provides the metals levels measured in the five surface water samples collected from the Site Area in the Bass River. It summarizes the EPA's chronic saltwater NRWQC and the concentrations measured in each of the five surface water samples. A review of this information shows that barium and mercury are the only two metals with measured concentrations above their laboratory Reporting Limits (RLs). Of the remaining nine metals, (a) chromium and silver lack a saltwater chronic NRWQC, (b) arsenic, cadmium, and selenium have detection limits which all fall below their respective saltwater chronic NRWQC, and (c) copper, lead, nickel, and zinc have detection limits which all exceed their respective saltwater chronic NRWQC. The latter are as follows:

- Copper: NRWQC = 3.1 μg/L; RL = 10 μg/L
- Lead: NRWQC = 8.1 μg/L; RL = 10 μg/L
- Nickel: NRWQC = 8.2 μg/L; RL = 10 μg/L
- Zinc: NRWQC = 81 μg/L; RL = 100 μg/L

The risk cannot be quantified when a detection limit exceeds a toxicity benchmark. This situation creates an uncertainty which should have been acknowledged in Section 7 (Uncertainty assessment) of the SLERA. Analyses that can achieve these benchmarks, should have been considered or if it was why the RLs could not achieve the NRWQC benchmarks.

The RL represents the lowest concentration standard used to make the calibration curve. The Method Detection Limit (MDL) is based on statistical calculations and typically is lower than the RL and represents the lowest concentration of a compound that can be qualitatively identified by the analytical method.

It is recommended to report concentrations determined between the RL and the MDLs for these four metals in Table II, and the use those values (qualified as "J", if necessary) to perform the COPEC-selection process. In addition, it is recommended to use alternative saltwater criteria for chromium and silver from published sources (e.g., EPA. 2006. Region III BTAG marine screening benchmarks; available at https://www.epa.gov/risk/biological-technical-assistance-group-btag-screening-values, or EPA. 2015. Supplemental Guidance to RAGS: Region 4, Ecological Risk Assessment. Originally published November 1995. Available at https://www.epa.gov/risk/region-4-ecological-risk-assessment-supplemental-guidance). The goal is to remove or minimize the uncertainty associated with analytes lacking ESVs.

SUMMARY AND CONCLUSIONS

A review was conducted on the Intertidal Sediment Data Summary Report and the SLERA for the Bass River intertidal area located next to the Retail Development South Parcel of the Former USM Facility in Beverly, MA. The review involved assessing the adequacy of the SLERA but to also focus on if the data are of sufficient quantity and quality to support the SLERA conclusions and future risk management decision making, or if the process needs to move towards a baseline ecological risk assessment. After reviewing and considering the available information, the opinion is that:

- The sediment dataset collected from the intertidal zone of the Site Area and the Reference Area of the Bass River is complete and robust enough to conclude that metals potentially leaching from the slag material are not impacting these sediments.

- Any potential ecological risk to benthic invertebrates exposed to divalent metals present in sediment from the Site Area or Reference Area is expected to be minimal due to the binding to sulfides in the pore water.

- Based on the current reference location selection, any potential ecological risk to wildlife receptors feeding on the sediments in the Site Area is not expected to be any worse than that in the adjacent Reference Area. This does not consider moving these reference areas to better locations. If they were moved, then food chain modelling would likely need to be reconsidered.

- The source for the high levels of some of the metals measured in sediment from the Site Area and Reference Area is unknown but does not appear to be strongly associated with the slag (note: this opinion is not verified via statistical testing).

- Proceeding with a BERA would not resolve the issue of whether the Reference Area should have been moved farther away from the Site Area and the outflow of the two Shoe Ponds. If an alternative Reference Area had been selected in one of the many bays in the Bass River much further downstream from the Site Area, it appears likely that the metal levels in these reference sediment samples would be substantially lower than those measured in the Site Area or, that at least the question of Site and Reference cross contamination would be eliminated. However, it is believed that the new information would not materially changed the overall outcome of the current SLERA because (a) the slag would still not have been identified as a major source of metals to the Site Area, (b) the divalent metals measured in the Site Area sediment samples would still have been considered likely unavailable to the benthic invertebrate community, and (c) it appears the historic outflow from Lower Shoe Pond would still be considered as one likely source of metals to the Site Area.

A determination has been made that a revised SLERA for the south parcel is not required and no further action for ecological risk assessment is required for this area.

REFERENCES

Long, E.R., D.D. Macdonald, S.L. Smith, and F.D. Calder. 1995. *Incidence of Adverse Biological Effects Within Ranges of Chemical Concentrations in Marine and Estuarine Sediments.* Environ. Manag. 19:81-97.

EPA. 1997. *Ecological Risk Assessment Guidance for Superfund. Process for Designing and Conducting Ecological Risk Assessments*. Interim final. EPA 540-R-97-006.

Attachment 1: Alternative COPEC selection for the sediment samples collected at the Site Area in the Bass River						
metal	Long *et al.* 1995[a]		alternative benchmark	range of detected concentrations[d]	original COPECs[d]	new COPECs[e]
	ER-L	ER-M				
arsenic	8.2	70	--	16.8 - 39.5	N	Y
barium	NA	NA	20[b]	35.89 - 112	Y	Y
cadmium	1.2	9.6	--	0.378 - 2.99	N	Y
chromium	81	370	--	144 - 1280	Y	Y
copper	34	270	--	70.2 - 1360	Y	Y
lead	46.7	218	--	132 - 819	Y	Y
mercury	0.15	0.71	--	0.286 - 2.3	Y	Y
nickel	20.9	51.6	--	20.9 - 297	Y	Y
selenium	NA	NA	2.0[c]	4.51 - 7.45	Y	Y
silver	1.0	3.7	--	0.779 - 4.03	Y	Y
zinc	150	410	--	189 - 498	Y	Y

all concentrations are in units of mg/kg

COPEC = contaminant of potential ecological concern; ER-L = effect range-low; ER-M = effect range-median

shading identifies new sediment COPECs

[a] Long, E.R., D.D. Macdonald, S.L. Smith, and F.D. Calder. 1995. Incidence of adverse biological effects within ranges of chemical concentrations in marine and estuarine sediments. Environ. Manag. 19:81-97.

[b] EPA Region IV. 2015. Supplemental guidance to ERAGS: Region 4, ecological risk assessment. https://www.epa.gov/risk/region-4-ecological-risk-assessment-supplemental-guidance

[c] freshwater sediment benchmark from EPA Region 3 BTAG, Freshwater sediment screening benchmarks. August 2006. Available at https://www.epa.gov/risk/biological-technical-assistance-group-btag-screening-values

[d] see Table IV in the United Shoe Machinery SLERA report

[e] calculated as ER-L or alternative benchmark divided by the maximum-detected concentration

Attachment 2: Metal concentrations in slag material compared to sediment samples collected from the Site Area and the Reference area in the Bass River					
metal	FOD	location	min	max	mean
arsenic	6 / 7	slag fill	0.92	56.0	17.0
	13 / 13	site area	18.0	39.5	29.1
	8 / 8	ref area	18.9	32.0	23.8
barium	7 / 7	slag fill	1.0	42.0	22.0
	13 / 13	site area	35.9	108	76.4
	8 / 8	ref area	47.2	105	78.8
cadmium	0 / 7	slag fill	ND	ND	--
	12 / 13	site area	0.5	3.0	1.9
	8 / 8	ref area	0.8	2.6	1.8
chromium	7 / 7	slag fill	2.6	75.0	40.0
	13 / 13	site area	144	1190	735
	8 / 8	ref area	362	1280	834
copper	7 / 7	slag fill	5.6	430	184
	13 / 13	site area	121	1210	296
	8 / 8	ref area	70.2	150	113
lead	7 / 7	slag fill	13.0	360	84.0
	13 / 13	site area	237	622	332
	8 / 8	ref area	132	332	223
mercury	3 / 7	slag fill	0.13	4.8	1.2
	13 / 13	site area	0.3	2.3	1.3
	8 / 8	ref area	1.0	1.9	1.4
nickel	7 / 7	slag fill	2.7	61.0	36.0
	13 / 13	site area	27.3	47.0	35.2
	8 / 8	ref area	20.9	36.3	28.2
selenium	0 / 7	slag fill	ND	ND	--
	0 / 13	site area	ND	ND	--
	8 / 8	ref area	4.5	7.5	5.9
silver	0 / 7	slag fill	ND	ND	--
	12 / 13	site area	0.8	4.0	2.6
	8 / 8	ref area	0.8	3.0	2.0
zinc	7 / 7	slag fill	7.2	600	192
	13 / 13	site area	265	341	314
	8 / 8	ref area	189	356	277

data sources : slag concentrations = Appendix F in SLERA, Site and Reference Area concentrations = Table V in SLERA

FOD = frequency of detection

ND = not detected